

TITLE OF THE INVENTION: EXTERNAL ROUTING MANAGER

BACKGROUND OF THE INVENTION

Field of the invention

The present invention relates to a method and a device for routing of information packets by means of routing protocol in just any network, preferably the Internet.

Discussion of the Background  
Prior art

The Internet today utilizes in the main different distributed routing protocols to manage the routing of Internet Protocol (IP)-packets. These distributed protocols contribute to making Internet a robust and scaleable network.

These protocols, however, also have some disadvantages. It will take comparatively long time to introduce new routing mechanisms, and the algorithms which are used to calculate routes are not allowed to be too demanding as far as calculation is concerned. In addition it is difficult to take into consideration demands from individual flows as far as the quality of the route is concerned, and/or calculate routes based on network information in combination with service information. The aim of the present invention consequently is to remove these disadvantages.

Summary of the invention

The above mentioned aim is achieved by a method and a device for routing of information packets by means of distributed routing protocols in just any network, at which an External Routing Manager (ERM) is utilized to attain a plurality of not distributed routing algorithms in said just any network as a complement to routing algorithms which are utilized by said distributed routing protocol.

This invention has the potential of becoming a key component in Telia's future IP (Internet Protocol)-network. With an ERM it will be possible to use a plurality of route calculation algorithms in the same network, each one  
5 adapted to both optimal network utilization and the demands on the carrier service by different applications. It also will be possible to create quite new carrier services, for instance increased support of mobility. All this functionality moreover can be adapted, and also be  
10 exchanged, any time at the same time as the network all the time is in operation.

Telia will be able to offer highly worked up IP-based carrier services if the ERM-concept is introduced in Telia's IP-network. These services will both be possible to  
15 be tailor-made to specific customers or groups of customers, and be introduced and adapted very quickly at changed conditions and needs.

Further characteristics of the present invention are given in the subclaims.

#### Brief description of the drawing

In the following a detailed description of an embodiment of the invention is given with reference to Figure 1.

25 Figure 1 shows the architecture of an ERM according to the invention.

#### Detailed description of an embodiment of the invention

In the following the overall functionality of the  
30 invention first will be described. After that, the function and the architecture of the ERM will be described. The different abbreviations which are mentioned throughout in the text are explained below:

35 ERM External Route Manager

ERM<sub>ap</sub> External Route Manager agent part

ERM<sub>rp</sub> External Route Manager router part

5           BRA           Basic Routing Algorithm

RPA                      Reference Point nr #

ERA      Explicit Routing Algorithm

The invention intends to make possible the utilization of routing algorithms as a complement to the distributed routing protocols of today. The invention also allows these completing algorithms to be considerably more demanding regarding calculations, and facilitates the use of service information at route calculations.

The invention includes a definition of which functionality that is required to make possible simultaneous use of more than one route calculation algorithm, without risking long-lasting, or even permanent, routing loops.

The invention makes possible use of not distributed routing algorithms as a complement to the algorithms which are used by distributed routing protocols. This means that explicit routes are set up through the network which replace the route which is determined by a distributed protocol. To allow this, a check should be made whether the new route is free from loops.

30 This new route is maintained until it is no longer needed, or until it is no longer valid due to that some kind of error has occurred. Such errors can be link errors, errors on any of the computers which are involved in maintaining the new route and/or routers which are included in this route.

35 When the new route no longer shall be used, concerned traffic returns to following the route which the

distributed routing protocol has selected. At this return it is important to secure that no routing loops will arise. If routing loops yet should arise, these should be possible to detect and break.

5       The basic functionality which is required to make possible simultaneous use of more than one route calculation algorithm can be collected in two functional groups, free and independent of which algorithms that are used to calculate explicit routes. We call these functional  
10       groups External Route Manager agent part, and router part (ERMap and ERMrp). When we refer to ERM, these two functional groups are referred to together.

      The physical location of the ERM-functionality differs between ERMap and ERMrp. Figure 1 shows the possible  
15       physical location of the functional groups and which reference points that exist between them. The exact definition of the functions and the specifications of respective reference point, however, is not dealt with here as this invention relates to the conceptual design of the  
20       architecture.

      ERMap should be localized in the same machine that has functions (ERA in Figure 1) to calculate explicit routes. This machine can be a router or a separate computer connected to the network where the explicit routes shall be  
25       used. The following functions are included in ERMap:

- check of that suggested explicit routes are free from loops.
- 30   • check whether potential loops may arise and, if so, identification of where such loops can arise, and
- attend to that potential loops do not occur.

35       ERMap interacts with ERMrp (RP2 in Figure 1) to establish and maintain explicit routes and prevent

emergence of loops by specifying methods at errors which can cause loops. ERMrp shall be localized in all routers which are involved in the explicit routes which are established via ERM. The following functions are included  
5 in ERMrp:

- detection of error after established explicit routes, and
- 10 • measure to prevent or break loops.

ERMrp interacts with traffic-control functionality in the router (RP3) to establish and maintain explicit routes. ERMrp also shall have information from the traffic control  
15 (RP3), or from the distributed route calculation function (RP4) about errors, if any. At such errors ERMrp shall take measures to prevent loops, and inform ERMap about executed measures.

ERMrp also receives information from the distributed  
20 route calculation function (RP4) about current network topology and, possibly, network status. ERMrp forwards this information to ERMap which utilizes it to execute the above mentioned functions. This information is distributed in the network by a distributed routing protocol of "link state"-  
25 type, for instance OSPF, IS-IS etc.

ERA can when a new route is suggested (RP1) also suggest alternative routes. These can be used by ERMap to prepare a more rapid change to such an alternative route in case of error along the route which is used. This can be  
30 prepared by state being established in concerned ERMrp or

by ERMap quite simply being prepared to distribute the alternative route to concerned ERMrp.

RP4 in Figure 1 is today usually used in a router to establish routes calculated by some distributed algorithm.

5 To sum up, it can be said that the invention differs from previously known technology chiefly by the managing of loops being separated from the route calculation algorithms. This results in that new algorithms can be developed quicker. The invention also makes it possible to return to the original route calculation algorithm if an error occurs. The concept and the mechanism for the managing of loops, and the return to the original algorithm, constitutes, as far as we know, new technology which is not previously known.

15           The above mentioned is only to be regarded as an advantageous embodiment, and the extent of protection of the invention is only defined in what is indicated in the enclosed patent claims.